

Appl. No. 10/676,961
Amtd. Dated 07/08/2005
Reply to final Office action of 05/31/2005

Amendments to the Specification:

Please replace paragraph [0010] - [0012], [0014], [0021], [0029], [0037], [0038], [0041], [0043], [0044], and [0048], respectively, with the following amended paragraphs:

[0010] Figure 4A is a diagram illustrating a cross-sectional view of an alternate staggered staggering configuration according to one embodiment of the invention.

[0011] Figure 4B is a diagram illustrating a top view of an alternate staggered staggering configuration according to one embodiment of the invention.

[0012] Figure 5 is a diagram illustrating a top view of an alternate staggered staggering configuration in both dimensions according to one embodiment of the invention.

[0014] An embodiment of the present invention is a technique to stack dies in a die assembly. A plurality of dies are stacked on top of one another in a staggered staggering configuration such that an upper die in a pair of adjacent dies face downward or upward and is displaced by a first distance with respect to a lower die in the pair. The adjacent dies are attached by an adhesive layer between the adjacent dies.

[0029] The stack of dies 120 includes any number of layers including pairs like the pair 120_k stacked on top of one another. Depending on how these pairs are stacked on one another, there are a number of staggered staggering configurations of the entire stack. Examples of these configurations include a stair-case configuration in one dimension, a stair-case configuration in both dimensions, an alternate staggered staggering configuration in one dimension, and an alternate staggered staggering configuration in both dimensions.

[0037] Figure 4A is a diagram illustrating a cross-sectional view of an alternate staggered staggering configuration according to one embodiment of the invention. For illustrative purposes, four dies are shown.

[0038] In this configuration, the dies 120₁ to 120₄ are arranged in a zigzag or alternate pattern. Dies form in pairs of adjacent dies. The dies may face together in the same direction or in opposite directions. In each pair, the upper die is offset from the lower die by a distance. The

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pairs are then stacked onto one another in alignment, resulting in an alternate staggered staggering pattern. For example, dies 120₁ and 120₃ are aligned and dies 120₂ and 102₄ are aligned.

[0041] Figure 4B is a diagram illustrating a top view of an alternate staggered staggering configuration according to one embodiment of the invention. For illustrative purposes, four dies are shown.

[0043] Figure 5 is a diagram illustrating a top view of an alternate staggered staggering configuration in both dimensions according to one embodiment of the invention. For illustrative purposes, four dies are shown.

[0044] In this configuration, the dies are arranged in the alternate staggered staggering pattern in both directions or dimensions. As seen from the top, only the upper pair is visible showing the dies 120₃ and 120₄. The lower pair including the dies 120₁ and 120₂ are hidden as viewed from the top. The conductors are shown to connect the bond pads of the dies to the bond pads of the substrate on all four sides of the stack of dies.

[0048] Next, the process 600 attaches the bottom die in the stack to the substrate by an adhesive layer (Block 660). Then, the process 600 stacks dies on top of one another in one of a stair-case and alternate staggered staggering configurations (Block 660) and is then terminated. The - staggered staggering or displacement of the dies may be parallel to a die edge or approximately diagonal to a die edge.